CLAIMS

1. An optical system through which an advancing optical path in which a light beam enters a reflector and a returning optical path of a light beam reflected and/or diffracted by said reflector pass, wherein

when assuming the thickness of an optical path through which said advancing optical path passes without being interrupted as a first thickness and the thickness of an optical path through which said returning optical path passes without being interrupted as a second thickness,

said second thickness is larger than said first thickness.

2. The optical system according to claim 1, wherein

an opening restriction device having a predetermined opening to determine said first thickness is included, and

said opening restriction device restricts the thickness of a light beam passing through an opening by changing optical paths of a light beam entering a region outside of said opening.

3. The optical system according to any one of claims 1 and 2, wherein

an opening restriction device having a predetermined opening to determine said first thickness is included, and

said opening restriction device restricts the thickness of a light beam passing through an opening by controlling the transmittance of a light beam entering

a region outside of said opening to a predetermined value or less.

4. The optical system according to any one of claims 1 and 2, wherein

an opening restriction device having a predetermined opening to determine said first thickness is included, and

said opening restriction device restricts the thickness of a light beam passing through an opening by disturbing the phase of a light beam entering a region outside of said opening.

5. An optical system wherein

when a light beam entering said reflector passes through the smallest opening, out of openings of said optical system through which the advancing light beam entering said reflector and the returning light beam reflected and/or diffracted by said reflector pass together when assuming (1) the distance between said light-beam passing position at the smallest opening and the center of the smallest opening as a first distance and (2) the distance between said light-beam passing position at said smallest opening and the center of said smallest opening as a second distance when the light beam reflected and/or diffracted by said reflector passes through said smallest opening,

said second distance is smaller than said first distance.

6. A position detector comprising:

a light source for emitting a light beam;

condensing means for converging the light beam emitted from said light source on a reflector;

beam branching means for branching the light beam reflected and/or diffracted by said reflector;

a photodetector for receiving a light beam branched by said beam branching means and outputting a signal corresponding to luminous energy; and

an arithmetic circuit for receiving a signal output from said photodetector and outputting a position detection signal; wherein

when assuming the thickness of an optical path through which an advancing optical path for the light beam emitted from said light source to be bound for said reflector can pass without being interrupted as a first thickness and the thickness of an optical path through which a returning path for said light beam to be bound for said photodetector from said reflector through said beam branching means can pass without being interrupted as a second thickness,

an optical system is constituted in which said second thickness is larger than said first thickness.

7. A magnetic recorder comprising:

a light source for emitting a light beam;

condensing means for converging the light beam emitted from said light source on an information storage medium;

beam branching means for branching the light beam reflected and/or diffracted by said information storage medium;

a photodetector for receiving a light beam branched by said beam branching means and outputting a signal corresponding to luminous energy;

an arithmetic circuit for receiving a signal output from said photodetector and outputting a position detection signal;

a magnetic head for recording and/or reproducing information into and/or from said information storage medium; and

transfer means for positioning said magnetic head by receiving said position detection signal; wherein

when assuming the thickness of an optical path through which an advancing optical path for the light beam emitted from said light source to be bound for said information storage medium can pass without being interrupted as a first thickness and the thickness of an optical path through which a returning optical path for said light beam to be bound for said photodetector from said information storage medium through said beam branching means can pass without being interrupted as a second thickness,

an optical system is constituted in which said second thickness is larger than said first thickness.

8. A position detector comprising:

a light source for emitting a light beam;

a diffraction device for generating a diffracted beam in a travelling direction different from the travelling direction of transmitted light beam by receiving said light beam;

condensing means for converging said diffracted beam on a reflector;

beam branching means for branching said diffracted beam reflected and/or diffracted by said reflector;

a photodetector for receiving said diffracted beam branched by said beam branching means and outputting a signal corresponding to luminous energy; and

an arithmetic circuit for receiving a signal output from said photodetector and outputting a position detection signal; wherein

when assuming the thickness of an optical path through which an advancing optical path for the light beam emitted from said light source and diffracted by said diffraction device to be bound for said reflector can pass without being interrupted as a first thickness and the thickness of an optical path through which a returning optical path for said light beam to be bound for said photodetector from said reflector through said beam branching means can pass without being interrupted as a second thickness,

an optical system is constituted in which said second thickness is larger than said first thickness determined by the size of said diffraction device.

9. An aperture-provided lens comprising an aperture having a first opening and a second opening

correspondingly to the body of a lens, wherein a diffraction device is provided for at least one of said openings.

10. The aperture-provided lens according to claim 9, wherein said second opening is larger than said first opening.

11. The aperture-provided lens according to claim 10, wherein

said first opening has a diffraction device, the direction in which light is diffracted by said diffraction device is assumed as a first direction, the direction perpendicular to said first direction in the plane of said first opening is assumed as a second direction, and the length corresponding to said first direction of said second opening is larger than the length corresponding to said second direction of said second opening.

12. The aperture-provided lens according to any one of claims 9 to 11, wherein

a second diffraction device is set in a region other than said first opening and said second opening, and

the percentage of the luminous energy penetrating without being diffracted by said second diffraction device is 5% or less.

13. The aperture-provided lens according to any one of claims 9 to 11, wherein concaves and convexes are formed on the surface of a region other than said first opening and said second opening.

14. The aperture-provided lens according to any one of claims 9 to 13, wherein

when assuming the diffraction device provided for said first opening as a first diffraction device and the diffraction device provided for said second opening as a third diffraction device,

the grating interval of said third diffraction device is smaller than the grating interval of said first diffraction device.

15. The aperture-provided lens according to any one of claims 9 to 13, wherein

said aperture-provided lens is provided with a region A and a region B; and

a light beam passing through said region A is condensed at a point different from a point where a light beam passing through said region B is condensed.

16. The aperture-provided lens according to claim 15, wherein

the region A and the region B of said aperture-provided lens are respectively provided with a flat portion and their normals are not parallel with each other.

17. The aperture-provided lens according to any one of claims 9 to 16, wherein

said diffraction devices have grating intervals differing in regions and the grating interval of the diffraction device in a region far from the center of a lens is larger than that of the diffraction device in a region close to the center of the lens.

18. The aperture-provided lens according to any one of claims 9 to 17, wherein said diffraction devices are the transmission type.

19. The aperture-provided lens according to any one of claims 9 to 18, wherein said lens is constituted integrally with an aperture.

20. The aperture-provided lens according to claim 19, wherein said aperture-provided lens is made of resin.

21. An optical system comprising an aperture whose opening diameter depends on a polarizing direction and a polarizing-direction rotation means, wherein

the opening of a light beam bound for a reflector is restricted by said aperture, the polarizing-direction of the light beam whose opening is restricted is rotated by said polarizing direction rotation means, and the opening of said light beam reflected by said reflector is not restricted when the light beam passes through said aperture again.

22. A position detector comprising:

a light source for emitting a light beam;

condensing means for converging a light beam emitted from said light source on a reflector;

beam branching means for branching a light beam reflected and/or diffracted by said reflector;

a photodetector for receiving a light beam branched by said beam branching means and outputting a signal corresponding to luminous energy; and

an arithmetic circuit for receiving a signal output from said photodetector and outputting a position detection signal; wherein

said condensing means is provided with an aperture having a first opening and a second opening and a diffraction device is provided for at least one of said openings.

23. A magnetic recorder comprising:

a light source for emitting a light beam;

condensing means for converging a light beam emitted from said light source on an information storage medium;

beam branching means for branching a light beam reflected and/or diffracted by said information storage medium;

a photodetector for receiving a light beam branched by said beam branching means and outputting a signal corresponding to luminous energy;

an arithmetic circuit for receiving a signal output from said photodetector and outputting a position detection signal;

a magnetic head for recording and/or reproducing information into and/or from said information storage medium; and

transfer means for positioning said magnetic head by receiving said position detection signal; wherein

said condensing means is provided with an aperture having a first opening and a second opening and a

diffraction device is provided for at least one of said openings.

24. A position detector comprising:

a light source for emitting a light beam;

a diffraction grating for generating a sub-beam in accordance with a light beam emitted from said light source;

a condensing optical system for condensing a light beam emitted from said light source on an information storage medium;

an aperture whose opening diameter depends on the polarizing direction of a passing light beam;

a quarter-waveform plate;

a photodetector for receiving the light reflected by said information storage medium and outputting a signal corresponding to the luminous energy of received light; and

an arithmetic circuit for receiving a signal output from said photodetector and outputting a position detection signal; wherein

the opening diameter of said aperture in the polarizing direction when the light beam reflected by said information storage medium passes through said aperture is larger than the opening diameter of said aperture in the polarizing direction when the light beam emitted from said condensing optical system is condensed on said information storage medium.

25. A position detector comprising:

a light source for emitting a light beam;

a mirror for reflecting a light beam emitted from said light source;

condensing means for converging light on a reflector;

beam branching means for branching a light beam reflected and/or diffracted by said reflector;

a photodetector for receiving a light beam branched by said beam branching means and outputting a signal corresponding to luminous energy; and

an arithmetic circuit for receiving a signal output from said photodetector and outputting a position detection signal; wherein

the relative positional relation between said light source and said mirror is determined so that the center of the luminous energy of a light beam emitted from said light source is brought to the center of the opening for restricting the advancing light beam bound for said reflector.